Chlorine Deactivation in the Lower Stratosphere During Polar Winter: Correlations Between UARS MLS and CLAES Data

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We have used simultaneous observations of ClO from the Microwave Limb Sounder (MLS) and $ClONO_2$ from the Cryogenic Limb Array Etalon Spectrometer (CLAES) onboard the Upper Atmosphere Research Satellite (UARS) to investigate the recovery of the perturbed chlorine chemistry in the lower stratosphere in both hemispheres. We studied periods in late winter, when the heterogeneous activation of chlorine had ceased (Feb. 12 - Feb. 28, 1993 in the northern hemisphere and Sept. 5 - Sept. 18, 1992 in the southern hemisphere). The ClO loss proceeds more rapidly at 22 hPa than at 46 hPa, and the fractional decrease in ClO is greater in the northern polar vortex than in the southern polar vortex. The magnitude of the ClO decrease exceeds the magnitude of the $ClONO_2$ increase, especially in the southern polar vortex. The quantity ClO+ $ClONO_2$ is seen to decrease during the deactivation periods in both hemispheres. We use a two dimensional chemical- dynamical model to investigate the effects of changes in the measurement solar zenith angle on both the ClO and $ClONO_2$ fields, and to further examine the expected chlorine partitioning. In addition, we compare the ClO behavior during the 1993 southern winter to that of the 1992 southern winter.

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